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PHOOTOGRAPHIC
INTERPRETATION
REPORT

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**SOVIET RESEARCH AND
DEVELOPMENT OF CONICAL
DEFENSIVE MISSILES (TSR)**

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SOVIET RESEARCH AND DEVELOPMENT OF CONICAL DEFENSIVE MISSILES (TSR)

ABSTRACT

1. (TSR) [] Two new, high-performance, probable conical missiles under development at Soviet defensive missile test centers may be using unusual, new rocket motors (shaped like the frustum of a cone) identified at two Soviet rocket motor research, development, and production facilities. [] rocket motor, identified at Kazan Missile Propulsion R&D Facility [] [] and at Perm Solid Motor Production Plant [] may be the booster motor for a high-acceleration, endoatmospheric antiballistic missile (ABM) in development at Sary-Shagan Missile Test Center [] And a [] rocket motor—identified at the same Soviet rocket motor research, development, and production facilities—may be either the booster motor for a new high-performance, probable antitactical ballistic missile (ATBM) in development at Emba Missile Test Center [] or the sustainer motor for the new Sary-Shagan ABM. 25X1
2. (TSR) This report provides all available photographic intelligence (PHOTINT) relating to the Soviet effort to develop conical missiles and missile components. This report contains a table, seven photographs, and three drawings. The information cutoff date is 1 January 1978. 25X1

INTRODUCTION

3. (TSR) [] The Soviets have a major effort underway to develop one or more radically new, high-performance defensive missiles. Evidence from both PHOTINT and signal intelligence (SIGINT)^{1,2} supports this conclusion. 25X1
4. (TSR) [] A program to develop a high-acceleration, endoatmospheric ABM is underway at Sary-Shagan Missile Test Center. A similar program, to develop a high-acceleration ATBM, may be underway at Emba Missile Test Center. Evidence indicates that both the Sary-Shagan and Emba programs involve conical missiles. A cone shape is particularly desirable for the design of high-acceleration vehicles. The most efficient way to power a high-performance conical missile is to fit the missile with solid propellant rocket motors that conform to the shape of the airframe. "Conical" rocket motors* identified at two Soviet rocket motor research, development, and production facilities (discussed below) may be involved in these new Sary-Shagan and Emba programs. 25X1

DESCRIPTION

"Conical" Rocket Motors

5. (TSR) Kazan Missile Propulsion R&D Facility and Perm Solid Motor Production Plant have been involved in the production and testing of rocket motors shaped like the frustum of a cone since at least 1975. Two different sizes of "conical" rocket motors have been identified at these facilities (Figure 1). The first rocket motor [] [] Both 25X1
[] 25X1
[] 25X1
motors were first observed at Kazan Missile Propulsion R&D Facility [] 25X1
The [] motor was subsequently seen there in 1976 and 1977. On the basis of the interpretation of several large-scale images of the [] motor, it has been confirmed as a "conical" rocket motor. The [] motor was observed at Kazan in 1975 only and has been identified as a "conical" probable rocket motor. Two "conical" probable rocket motors, apparently identical to those at Kazan Missile Propulsion R&D Facility, were later identified at Perm Solid Motor Production Plant—the [] motor on [] 25X1
6. (TSR) The placement and movement of "conical" rocket motors within Kazan Missile Propulsion R&D Facility indicate that at least seven [] rocket motors 25X1
have been tested at the facility. The motors have been observed in a boneyard (Figure 2), except on one occasion when two [] motors were observed near the crate storage area (Figure 3). The 25X1
motors identified in the boneyard are probably spent motor casings from previous tests. The Soviets have made some effort to bury motors and other hardware in the boneyard. Because of the poor interpretability and infrequency of imagery during the early 1970s, the beginning of the "conical" rocket motor programs at Kazan cannot be accurately dated. Although the first "conical" motors were not identified at Kazan until May 1975, they could have been present at the facility two or three years before. 25X1

* Although the rocket motors discussed in this report are shaped like the frustum of a cone, for the sake of brevity they are sometimes referred to in this report as "conical." The missiles described here as conical more closely approximate the true shape of a cone.

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7. (TSR) The [] probable rocket motor was identified at Perm Solid Motor Production Plant []. This is the only time that the [] motor has been seen at Perm. The motor was in a storage yard near the type A horizontal test cell of the rocket motor test facility. The [] probable rocket motor was identified in the same area on []. These "conical" probable rocket motors appear to be identical to the ones previously observed at Kazan Missile Propulsion R&D Facility.

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8. (TSR) [] The propellant(s) for both sizes of "conical" motors is probably produced at Perm Solid Motor Production Plant or Perm Munitions and Chemical Combine K. Kirov 98 []. These plants produce double-base, composite, and composite modified double-base propellants. But, as neither of the two rocket motors have been observed in the propellant production areas of the two plants, there is no indication of the propellant composition of these motors. The presence of the motors at the Perm Rocket Motor Test Facility is evidence that some were tested there. Those "conical" rocket motors tested at Kazan Missile Propulsion R&D Facility were probably also produced at Perm, as there is no known solid propellant production capability at Kazan.

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Conical Defensive Missiles

9. (TSR) "Conical" missile stages (shaped like the frustum of a cone) have apparently been used in at least two defensive missile test programs, one at Sary-Shagan Missile Test Center and one at Emba Missile Test Center.

10. (TSR) At Sary-Shagan Missile Test Center, a new conical ABM was identified at Launch Complex F []. This is the only time that the missile has been observed on KEYHOLE imagery. The missile is conical for at least the forward two-thirds of its length. Precise dimensions were impossible to obtain, but its length is estimated to be between 12 and 13 meters. The maximum (base) diameter of the missile could not be directly observed []. It is unlikely that the diameter is much larger than this; but, because of uncertainties about the interpretation of the only image available, it is entirely possible that the base diameter is considerably smaller, []. Individual stages of the missile could not be identified, and no control surfaces were observed on the airframe.

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11. (TSR) There is no evidence that the conical missile was ever launched from its rail launcher at launch site 5. The launcher was modified in 1974 by the substitution of an [] open-lattice-type launch mechanism in place of the [] launch rail. A new launch position, similar to the site 5 position, was recently constructed at launch site 3. But instead of a launch rail or lattice-type mechanism, the new launcher has a [] launch tube with an inner [].

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12. (TSR) [] a new, high-acceleration interceptor was launched from []

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complex F. The test probably came from either the modified site 5 launcher or the new site 3 launcher. The size of the missile is unknown, as it was not seen on KEYHOLE imagery. It has not been possible to determine whether this missile is the same as the one identified in 1973 at launch site 5, but the high acceleration of the missile launched indicates that its shape may be conical and confirms that an endoatmospheric ABM is in development at Sary-Shagan Missile Test Center.

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13. (TSR) At Emba Missile Test Center, a new missile was identified on a transporter-erector-launcher (TEL) at pad C2 of the Emba Missile Test Center Launch Complex.

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image presents another difficult interpretation problem, however, and as a result, the shape of the missile has never been confirmed. There are indications in the image that the airframe of the missile may be at least partly conical.

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14. (TSR) Several "conical" pieces of probable missile wreckage were observed near the pad C2 launch position from May through August 1974 (Figure 9). This coincides with the identification of the probable conical missile.

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The wreckage may be expended "conical" missile stages retrieved from downrange impact after several launches of the probable conical missile. The size of the debris is essentially the same as an estimated size of the first stage of the missile. That estimate is based upon the location of probable second stage control surfaces identified on the airframe.

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15. (TSR) The new Emba missile, the "conical" probable missile stage debris, and the high-acceleration missile tests may all be part of the same program. Although this cannot be confirmed, together these factors support the argument that a high-performance ATBM was in development at Emba Missile Test Center during 1974.

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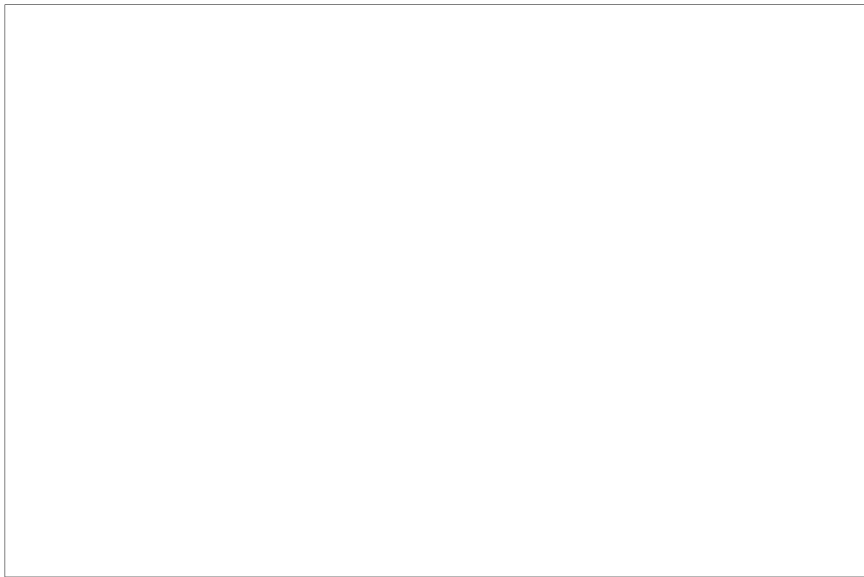
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Compatibility of Known "Conical" Rocket Motors with Conical Missiles

16. (TSR) While no associations can be confirmed at this time, a comparison of the photographically derived sizes and shapes of the two "conical" rocket motors* and the two conical defensive missiles* is a useful method of defining the possible combinations of motors and missiles. Table 1 gives the photographically obtained data for each of the objects in question. Because of the uncertainties about the diameter of the Sary-Shagan missile (see paragraph 10), dimensions are given that represent not only the best estimate of the missile's size, but also the largest and smallest likely sizes of the missile.

17. (TSR) Figure 10 is a graphic representation of the objects involved, based upon the dimensions from Table 1. It shows the possible ways that the two "conical" motors might be compatible with the expended Emba probable missile stage, the Emba missile, and three possible configurations of the Sary-Shagan missile.** What is immediately apparent from Figure 10 is that the [] motor is too large to be used in the Emba missile or in the second stage of the Sary-Shagan missile. The [] motor is too small to be used as a first stage propulsion system for the Sary-Shagan missile. In addition, [] motors are not dimensionally compatible in a tandem configuration as first and second stage motors of the same missile.

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18. (TSR) The best match between motor and missile seems to be between the [] motor and the first stage of the Emba missile. The size and shape of the missile's first stage (as estimated from mensuration of both the missile and the expended probable first stages) are compatible with the size and shape of the [] motor. Figure 10 suggests a second possibility for the [] motor, however. It may fit the second stage of the Sary-Shagan missile.

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19. (TSR) The [] motor is too long to be a sustainer motor for a defensive missile. Its large size, "conical" shape, and identification at defensive missile-associated production plants indicate that the [] motor is probably a defensive missile booster motor. The [] motor is too large for the probable conical Emba missile. However, it might be dimensionally compatible with the first stage of the Sary-Shagan missile if the smallest likely estimate of that missile's size is the correct one (Figure 10).

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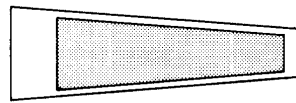
20. (TSR) In addition to the possibilities cited above, the two rocket motors reported here could be associated with other conical missiles that may be in development but that have yet to be identified on KEYHOLE imagery. With two probable, two stage conical missiles identified and only two "conical" rocket motors known, it is very likely that prototype quantities of other Soviet "conical" rocket motors have been produced and tested without appearing on KEYHOLE imagery.

* One confirmed, one probable.

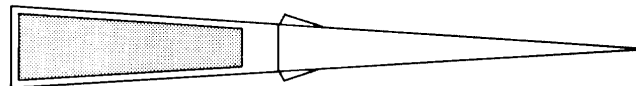
** The configuration of the conical US SPRINT is shown for comparison. The SPRINT is a high-acceleration, endoatmospheric ABM.

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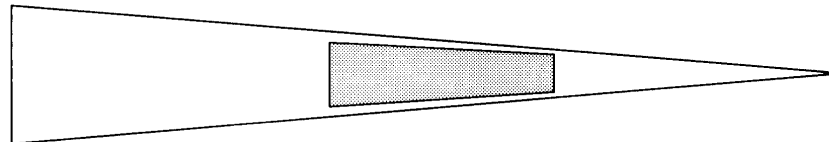
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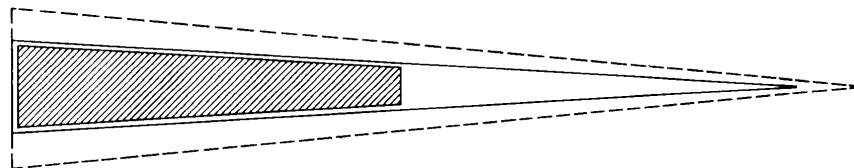
EXPENDED EMBA PROB MISSILE STAGE



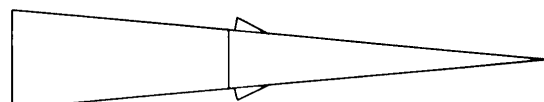
EMBA PROB CONICAL MISSILE



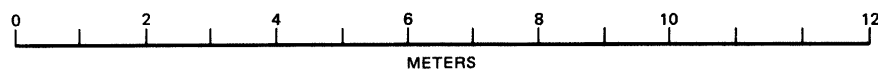
BEST DIMEN ESTIMATE OF SARY-SHAGAN CONICAL ABM



MAX/MIN ESTIMATES OF SARY-SHAGAN CONICAL ABM



US SPRINT



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NPIC S-5101

FIGURE 10. POSSIBLE CONFIGURATIONS OF SOVIET "CONICAL" ROCKET MOTORS WITHIN CONICAL DEFENSIVE MISSILES. The US SPRINT is shown for comparison.

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MAPS OR CHARTS

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- CIA. *IAS/MSD 173/75, Comparison of New Defensive Missile and Debris at Launch Area C, Emba MTC*, Jul 75 (TOP SECRET RUFF)

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- NPIC. *RCA-19/0001/78, Emba Missile Test Center (S)*, Dec 77 (TOP SECRET RUFF/

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Sary-Shagan Missile Test Center:

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REQUIREMENT

Project 143490NC

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List of Conversion Factors by Classification

UNITS OF LENGTH

<i>IF YOU HAVE</i>	<i>MULTIPLY BY</i>	<i>TO OBTAIN</i>
MILLIMETERS	0.0394	INCHES
CENTIMETERS	0.3937	INCHES
INCHES	25.4000	MILLIMETERS
INCHES	2.5400	CENTIMETERS
FEET	0.3048	METERS
FEET	0.0003	KILOMETERS
YARDS	0.9144	METERS
METERS	3.2808	FEET
METERS	0.0005	MILES(NAUTICAL)
METERS	1.0936	YARDS
KILOMETERS	3280.8400	FEET
KILOMETERS	0.6214	MILES(STATUTE)
KILOMETERS	0.5400	MILES(NAUTICAL)
MILES(STATUTE)	1.6093	KILOMETERS
MILES(NAUTICAL)	6076.1154	FEET
MILES(NAUTICAL)	1.8520	KILOMETERS
MILES(NAUTICAL)	1852.0000	METERS

UNITS OF MASS

<i>IF YOU HAVE</i>	<i>MULTIPLY BY</i>	<i>TO OBTAIN</i>
KILOGRAMS	2.2046	POUNDS(AVOIR.)
POUNDS(AVOIR.)	0.4536	KILOGRAMS
SHORT TONS	0.9072	METRIC TONS
METRIC TONS	1.1023	SHORT TONS
METRIC TONS	0.9842	LONG TONS
LONG TONS	1.0160	METRIC TONS

UNITS OF VOLUME

<i>IF YOU HAVE</i>	<i>MULTIPLY BY</i>	<i>TO OBTAIN</i>
LITERS	0.2642	GALLONS
LITERS	0.0063	BARRELS(POL)
LITERS	0.0010	CUBIC METERS
GALLONS	3.7854	LITERS
GALLONS	0.1337	CUBIC FEET
GALLONS	0.0238	BARRELS(POL)
GALLONS	0.0038	CUBIC METERS
BUSHELS	0.0352	CUBIC METERS
CUBIC FEET	7.4805	GALLONS
CUBIC FEET	0.1781	BARRELS(POL)
CUBIC FEET	0.0283	CUBIC METERS
CUBIC YARDS	0.7646	CUBIC METERS
BARRELS(POL)	158.9873	LITERS
BARRELS(POL)	42.0000	GALLONS
BARRELS(POL)	5.6146	CUBIC FEET
BARRELS(POL)	0.1590	CUBIC METERS
CUBIC METERS	1000.0000	LITERS
CUBIC METERS	264.1721	GALLONS
CUBIC METERS	35.3147	CUBIC FEET
CUBIC METERS	28.3776	BUSHELS
CUBIC METERS	6.2898	BARRELS(POL)
CUBIC METERS	1.3080	CUBIC YARDS

UNITS OF AREA

<i>IF YOU HAVE</i>	<i>MULTIPLY BY</i>	<i>TO OBTAIN</i>
SQUARE CENTIMETERS	0.1550	SQUARE INCHES
SQUARE INCHES	6.4516	SQUARE CENTIMETERS
SQUARE FEET	0.0929	SQUARE METERS
SQUARE YARDS	0.8361	SQUARE METERS
SQUARE METERS	10.7639	SQUARE FEET
SQUARE METERS	1.1960	SQUARE YARDS
SQUARE METERS	1.0000	CENTARES
SQUARE METERS	0.0002	ACRES
SQUARE METERS	0.0001	HECTARES
ACRES	4046.8564	SQUARE METERS
ACRES	0.4047	HECTARES
HECTARES	10000.0000	SQUARE METERS
HECTARES	2.4711	ACRES

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